American
GAS JOURNAL
Formerly American Gas Light Journal
EST. 1859

Vol. 118. No. 19.
WHOLE NO. 2405.

NEW YORK, SATURDAY, MAY 12, 1923

Subscription $3 per year
$4 Canada - $5 Foreign

Library of Congress
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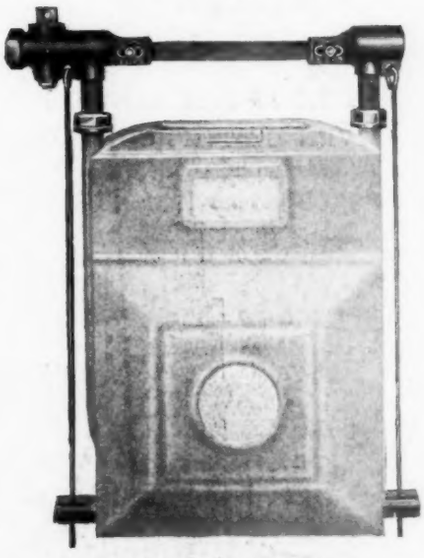
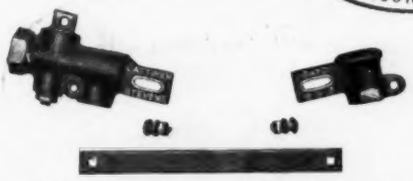
Lattimer-Stevens
Meter Connections

Another Tie-In Bar Type.



No. 406 Connection with Shelf meets requirements where end openings are desired. Stop cock built in.

No. 405 Connection Apart



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72 Yale Avenue — **Columbus, Ohio**

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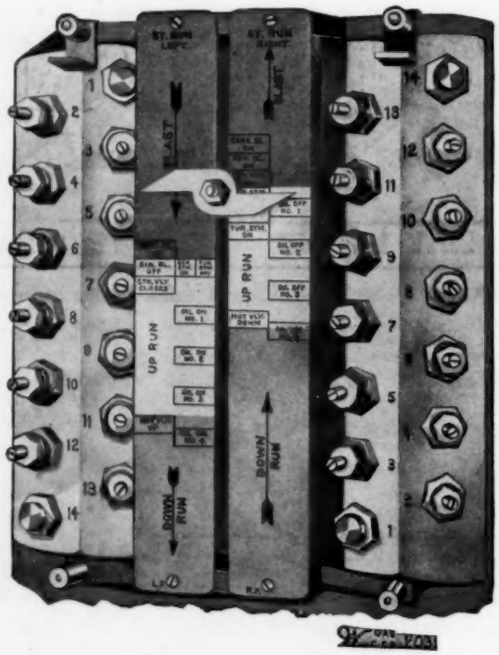

Close-up of the Indicator
(The Cover plates over Timing Screws were removed for this picture.)

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of Operation

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Water Gas Sets

Includes

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Any combination of blast time, down-run time and up-run time,

Changes as small as **FIVE SECONDS** in any part of the cycle,

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Quick changes to timing device,

INSTANT change to hand control;

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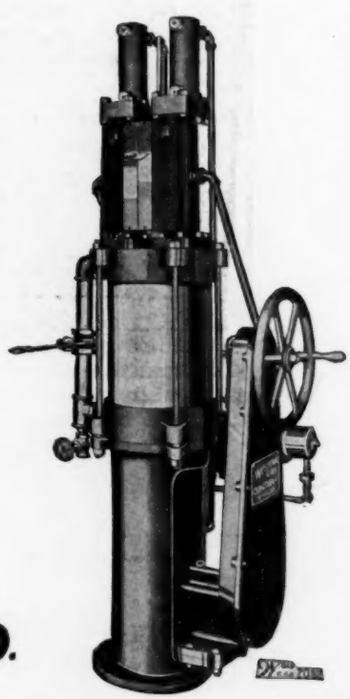
Bulletin J-210-E

This control will pay its own way by increasing the gas making capacity, by reducing the lbs. generator fuel per M, and by reducing the clinkering time.



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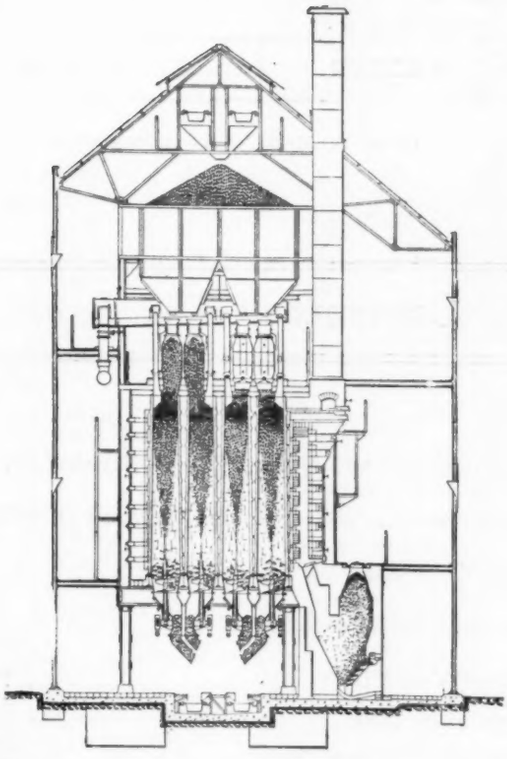

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Vertical Retorts is the small number of men required to attend to the plant, and the consequent low labor costs, compared with other systems of coal-gas manufacture.

WEST GAS IMPROVEMENT CO.
of America, Inc.
150 Nassau St. New York

American Gas Journal

SIXTY-THIRD YEAR

Published Weekly by American Gas Light Journal, Inc., 53 Park Place, New York, N. Y.

ELBERT P. CALLENDER, Pres. S. G. KRAKE, Vice-Pres.-Treas. A. M. GLEASON, Sec'y.

WALTER A. FAIRSERVIS, Editor

CHAS. S. MYERS, Field Representative

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Subscription $3.00 per year, including postage, in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines; in Canada, $4.00; foreign, $5.00—Single Copies, 10 cents.

AMERICAN GAS JOURNAL, May 12, 1923. Vol. 118, No. 19.
Published weekly by American Gas Light Journal, Inc., New York, N. Y.
Entered as second-class matter Jan. 9, 1917, at the post-office at New York, N. Y., under the Act of March 3, 1879.

American Gas Journal
Formerly American Gas Light Journal

Vol. 118. No. 19 NEW YORK, MAY 12, 1923 Whole No. 3405

Mixing Manufactured and Natural Gas in Buffalo

THE RESULTS HAVE BEEN SATISFACTORY TO CONSUMER AND COMPANY

When the Iroquois Natural Gas Company of Buffalo, a natural gas producer and distributor, was authorized by the Public Service Commission of New York to merge the Niagara Gas Corporation, a distributor of manufactured gas, thereafter to sell to the consumers of both companies a mixed gas product, it did not embark upon an absolutely uncharted sea as the same proposition had been worked out successfully elsewhere during the past few years. Yet there are phases of the Buffalo merger which make it different from any heretofore accomplished and there are difficult problems to be solved, requiring the closest study and attention.

The merger in Buffalo affects about 105,000 consumers, 83,000 of whom were formerly natural gas consumers while the balance were using manufactured gas. The first problem therefore is to effect a physical merger of the two distribution plants in order that the same kind of gas can be distributed to all consumers alike. This necessitates an adjustment of all gas using appliances on one or the other of the two old systems, and since the gas to be distributed in the next few years will contain a preponderance of natural gas, the appliances formerly used with manufactured gas are the ones which first require adjustment. This work is now in progress and all consumers will be using the same gas mixture before the end of the coming summer.

The process of adjustment of consumers appliances to adapt them to the use of a new kind of gas without serious interruption of good service conditions presents one of the most important of the many problems confronting the gas company. The general run of consumers can not be expected to appreciate the magnitude of the task and are concerned only with the matter of inconvenience to themselves. Therefore, in order that no general dissatisfaction shall be aroused it is necessary that the combined service departments of the two original companies be greatly amplified and the nature of their work broadened, for it is hoped by the management that by proper educational work supplemented by perfect service, not only will the work of changing over be accomplished without dissatisfaction but that the approval and friendship of its consumers may be secured by the company.

To Test Appliances

A laboratory is being installed for examining and testing all gas using appliances and the company intends to urge its consumers and prospective consumers to use no appliances that have not received the formal approval of its testing laboratory.

The company is urging all consumers who are not obtaining complete satisfaction in the use of gas to permit its service department to give advice and suggestions in order that entire satisfaction may be secured. It is the opinion of the company officials that a service of this character, which is intended to convince the consumer that the gas company is working for his best interests, will not only greatly increase the popularity of the company but will add enormously to the demand for gas.

During the past winter the gas distributed in the old manufactured gas system in Buffalo was straight coke oven gas of about 545 B. t. u., with a small quantity of carburetted water gas added during severe peaks. In a short time this system will be converted to the use of a natural-manufactured mixture, when the system will be coupled to the natural gas plant.

The gas delivered to the old natural gas system during the winter consisted, on the average, of a mixture of about 80 per cent natural gas of 1100 B. t. u., with 20 per cent coke oven gas of 545 B. t. u., thus making an average mixture of about 990 B. t. u., with a specific gravity of about 0.60. During severe peaks a quantity of carburetted water gas was added to this mixture, but the resulting heating value rarely went below 900 B. t. u. It was found that these mixtures could be used with entire satisfaction in the appliances originally adjusted for natural gas.

It has been found that the trouble point occurs when the mixture of these gases reaches a point resulting in a heating value of about 850 B. t. u. Consequently the program contemplated by the company now comprehends the gradual adjustment of all appliances on its system to accommodate mixed gases ranging in heating value from about 900 B. t. u. down. This will provide for the satisfactory use of the gas that will be distributed by the company for some time to come, and as the proportion of natural

T. R. WEYMOUTH,
President, The Iroquois Gas Corporation

gas in the mixture becomes less and less, continuous adjustment will be made until eventually, in the indefinite, and more or less distant future, the system will be on a manufactured gas basis.

No Mechanical Difficulty Encountered

No difficulty is experienced in effecting a perfect mechanical mixture of gases, and, contrary to the popular belief, once the gases are mixed they stay mixed permanently. Furthermore the mixture is much freer from impurities than is straight manufactured gas, and, as has already been shown, has a heating value about 65 per cent higher than that required by the laws of the state.

The company is sparing no expense in its plans to improve the service. Improvements costing over a million dollars will be installed this year, consisting of high and low pressure pipe lines, regulators, pump station machinery, measuring devices, purifying equipment, and a gas holder of 5,000,000 cu. ft. capacity.

The natural gas supplied by the company comes from Pennsylvania and New York States. The coke oven gas is supplied by the Donner Steel Company, in the southern part of Buffalo, and the Semet-Solvay Company in Tonawanda. The corporation manufactures its own water gas. During the past winter peak deliveries of about 61,000,000 cu. ft. per day were maintained, and it is anticipated that next winter the demands will be considerably in excess of this amount, for which ample provision is being made.

Service Has Been Good

The gas service supplied by the Iroquois Gas Corporation during the past winter was exceptionally good. No difficulty at all was experienced until the last of March when one or two days of low pressure were encountered, owing to the fact that because of the week or two of warm weather preceding, many people who had used coal or coke all winter for heating purposes had let their supplies of hard fuel run out and connected their furnaces with gas. Consequently when the severe cold weather of the end of March came on, an abnormal demand for gas was created with a resulting deficiency in service for a day or two. This, however, was not serious, and it is expected by the company officials that next year will witness a 100 per cent service record.

ENRICHED WATER GAS PLANT

A generator and combustion chamber are placed alongside each other and are so operated that during the blow the primary air always enters the generator below the level of the fresh coal, and passes downward before entering the combustion chamber. During the run the steam or the mixture of steam and oil enters at the top of the combustion chamber and passes downward through highly heated material before entering the ash zone of the generator chamber. The resulting gases leave through the fresh fuel at the top and the distillation gases thus produced mix with the water gas. For further details see British Patent No. 182,648.

REMOVING SULPHURETTED HYDROGEN FROM GAS

The gas mixture is alternately passed through solutions of alkalies or alkaline materials which contain suspensions of iron hydroxides or carbonates and the resulting iron compounds are oxidized by treatment with air. After one oxidation has been performed on the iron compounds, the action of the sulphur-containing gases is allowed to proceed only so far that a considerable part of the iron compounds remain in the unreduced condition. In the place of suspensions of the iron hydroxide or iron carbonate, alkaline solutions can be used as well. The process is patented by the Badische Anilin und Soda Fabrik, in German Patent No. 334,524.

Steam Requirements at a Gas Works*

THE IMPORTANCE OF AN INVESTIGATION

By Alan D. Whittaker, Atlanta, Ga.

How much steam is required at a gas works? That is a pertinent question—a very important question. Can a satisfactory answer be obtained? Hardly any two gas works are alike, and steam requirements may widely differ, yet gas engineers must have some basis in arriving at the size and number of boilers required for a plant, especially a new plant.

How can the old established plants from the smallest up find out if their steam consumption is too large or not? It was in studying this question and in measuring the steam used in Atlanta gas plant that I gathered the data that forms the basis of this paper.

Somewhere in this paper I want to bring out a few points about the importance of boiler room economy, and I might as well touch on this now and possibly hold the attention of some who might claim that tests and accuracy in the boiler room are beyond their reach, as their plants are too small.

"Dividends are made in the retort house" is an old slogan, and retort house operations should certainly be conducted with that in view, but it does not relieve us of the closest scrutiny of all operations from the coal shed to the ash dump.

The boiler room is a good place to start on this close scrutiny. What do we find in the small plant? For reasons of economy and labor saving, fuel is not weighed, feed water is not measured and no tests of flue gas or stack temperature are taken. The fuel is refuse and tar. The boiler is often considered the incinerating plant of the works and a good place to get rid of any combustible junk.

What would be gained by analyzing boiler operations under these conditions? We are apt to say that nothing could be gained and any intensive study of the matter would be a waste of time. Before these reasons should be considered final and conclusive let us ask a few questions. Tar is being burned under the boilers, what kind of tar is this? Could it be sold locally and at what price? A gallon of good tar is equivalent to about 9 pounds of coal as a fuel. With steam coal at $5 per ton, this is 2¼ cents per gallon. Could you get more for the tar if sold locally? How about the coke breeze that is being used under the boilers, is there any market for this? Would it actually add to cost of operating to weigh boiler fuel? Why not measure the water? A cold water meter is not expensive and the water could be run through this into a tank under the injector. With the fuel weighed and the water measured, the boiler becomes a source of new interest and attention. Other details will be followed up—correct firing and clinkering, correct schedule for blowing off, closer inspection of interior for scale, unnecessary smoke will be stopped and stack temperatures may be read occasionally. Then will come the decision to reduce the unnecessary steam made as much as possible. All steam pipes will be carefully covered, exhaust steam will be used for heating the feed water and for other purposes where live steam is being used for heating rooms or material of any kind. The more we know about the details of our operations the more interest we are going to take in them and the more chances of economy will be suggested.

At the Atlanta plant there were some points in connection with steam production and consumption that were not perfectly clear to us, and we decided to make a thorough survey of the steam system. In the Atlanta plant the annual production of coal gas is about three hundred million cubic feet and the water gas one billion cubic feet per year. The boiler plant consists of five horizontal tubular boilers of 150 H. P. each, one 250 H. P. boiler and one waste heat boiler on coal gas system of 120 H. P. Steam is used for the following apparatus: Water gas generators, water gas exhausters, coal gas exhausters, mixed gas exhausters, turbine pushers, gas compressor, various pumps for oil, water, ammonia liquor, etc., steam siphon on holder drips, ammonia still, reserve turbine driven blowers, tar dehydrator, steam hydraulic elevators.

Electric motors are used on the following: Water gas blowers, various coal and coke conveyors, coal crane, charging machines, centrifugal pumps, machine shop machinery and air compressor.

Holder Station Quarter Mile Away

The holder station is located a quarter of a mile from the main plant and a separate boiler is located there and is fired up when the weather is cold enough to require it. Steam for the holders, therefore, does not come under the consideration of this paper.

This is our plant, now how much steam should we use?

We were weighing boiler fuel accurately. All the fuel had to be wheeled a short distance from storage to boilers and we got accurate weight by having all the fuel required for 24 hours wheeled during one shift over the scales and carefully weighed and stored in bins in front of the boilers. This gave us the boiler fuel per 1,000 feet of gas made. The fuel consisted principally of steam coal and coke breeze. The fuel used per 1,000 was reasonable by comparison with other places, but still we did not know how much work this fuel was accomplishing. The next step was to measure the feed water. The feed water is hot, about 208 deg. Water of this temperature is hard to measure continuously with an ordinary type of meter. We had tried plunger, rotary and disc meters without prolonged success. We have an open heater and the meter had to be placed on

*Paper read at Southern Gas Association Convention.

the discharge from pump and was, therefore, under heavy pressure, and this tended to increase the speed of deterioration. We finally got a V-notch meter with a recording device and this has worked satisfactorily.

Finding the Steam Consumption

However, we did not have to wait until this V-notch meter was installed before we began to measure our steam consumption, as we tackled the question from the other end. We began to condense the exhaust steam from each pump, engine, etc., and find the steam consumption in that manner. We rigged up a coil consisting of about twelve horizontal pipes connected at the ends and placed in a vertical position and let cold water trickle down over these coils from a V trough over the top. The exhaust of the pump or engine would be connected to the coil and the condensation collected in a small tank. The condensed steam collected during 24 hours was carefully measured. This gave us a very accurate line on the steam consumption of the various units up to those having 4 or 5 inch exhaust pipe. Our turbine driven pushers have a 12-inch exhaust pipe and in this case the steam consumption was measured by a Republic flow meter on the steam inlet line. We also used a Republic flow meter on the steam supplying the siphons at the holder drips, as there was no way to measure the condensed steam in that case. We used the Republic flow meter to check up steam consumption on several of the units where we had condensed the exhaust and also to check up the steam used by water gas generators, and the result of all these tests is given in the following table:

Unit	Steam per 24 hrs.	Boiler H. P. 34 lbs. basis	Lbs. steam per 1000 ft. per 24 hrs. W.G.	C.G.	M.G.	Equivalent steam per 1000' M.G.
W. G. Scrbr. Pump	8184	10.03	3.13			2.14
Amm. Circulating	6288	7.71		5.42		1.54
Amm. Pump. No. 1 Scrbr.	7152	7.17		6.17		1.75
Tar Pump at Tar Well	851	1.40		.76		.22
Steam Traps	9217	11.29			2.25	2.25
Oil Scrbr. Pump	4446	5.45			1.13	1.13
Feed Pump	17475	21.40	5.00	4.00	4.70	4.70
C. G. Exhauster	11629	14.22		9.41		2.94
Deep Well Pump	5304	6.50			1.32	1.32
Amm. Still Pump	2654	3.25		2.18		.68
Air Comp. Amm. Still	1354	1.66		1.00		.36
Oil Pump—W. G.	3953	4.84	1.56			1.04
W. G. Exhauster No. 4	19280	23.63	6.73*			4.67
Oil Unloading Pump—2 cars	480	.60	0.17		.12	.12
No. 1 M. G. Exhauster	14672	17.98			4.04	4.04
Ice Mch. Brine Pump	4048	4.97			1.00	1.00
Gas Compressor No. 1	12341	15.10			3.36	3.36
Gas Compressor	11056	13.55				2.95
Holder Drips	4500	5.51	2.05			1.37
Mitchell Scrbr. Eng.	14531	17.68		13.2		4.40
Turbine Pushers	33000	36.77			10.00	10.00
Tar Dehydrator	5248	6.73			1.59	1.59
Waste Heat Turbine	46241	56.67			14.40	14.40
Press. Pump No. 5 Set	5658	6.9	2.57			1.71
Tar Pump-Ret. House	760	.93		.7		.23
Tar Pump At Well	950	1.16		.86		.29
Tar Pump in Pit	659	8.1		.6		.20
Tar Pump	440	.54			.13	.13
Tar Pump at Holder	440	.54			.13	.13
Elev. No. 5 W. G. Set	1560	1.91	.70			.49
Elev. Coke Bin	500	.6		.45		.17
Ammonia Still-Exhaust Steam W. G. Set	96530	118.30	35.00			24.6
Tar Loading Pumps	1354	1.66			.40	.40
	349758	428.5	56.91	44.75	44.57	96.32

From this table it appears that water gas requires a total of about 57 lbs. steam per 1,000 ft., coal gas 45 lbs., apparatus handling both gases 45 lbs., making the total steam per 1,000 ft. mixed gas about 96 lbs. Now that we have the V-Notch meter in use we find we use about 102 lbs. steam for all purposes, which agrees fairly closely with figures in tables, 96.32 lbs.

In the Gas Works Book, published by United Gas Improvement Co., on page 129, is given a table of steam used in moderate size works. This table is as follows:

	Lbs. steam per 100 cu. ft. Gas Made	
	Works No. 1	Works No. 2
Water Gas Set	36.59	26.10
(a) Blower	16.39	19.50
Exhausters	7.85	11.21
Tar burner under boiler	5.70	
Circulating pump	3.86	1.63
Pusher	3.75	3.87
Boiler feed pump	2.72	3.00
Condenser pump	2.58	3.26
Oil pump	1.36	.81
Steam traps	.88	3.20
Elevator (steam hydraulic)	.38	
Drip pump	.15	.31
Tar pump	.14	
(b) Heating holders and tanks		3.61
Shop engine		.96
Fuel handling engine		.52
Miscellaneous pumps.		1.46
Steam unaccounted for	2.64	
Total	84.99	79.44

(a) Positive blower used at No. 1 Works. Fan blowers belted to high speed automatic engine at No. 2 Works.

(b) Holders heated with hot water from condensers and heaters.

Test No. 1 was made in a works using 6′ 0″ U. G. I. water gas apparatus. Duration of test, 24 hours.

Test No. 2 was made in a works using 10′ 6″ U. G. I. water gas apparatus. Duration of test, 24 hours.

The Charleston (S. C.) Consolidated Railway & Lighting Company very kindly furnished the following table showing the steam used by the different units at the gas works.

Apparatus	Type and Size of Apparatus	Duty	Lbs. steam per M.
Set	7′ 6″ U. G. I.		37.00
Blower	12x12 Vertical Troy—46 H. P., driving No. 7 A Wilbraham-Green Positive Blower	8000 cu. ft. per min. against 30″ pressure	14.20
Exhauster	14x12 Vertical Troy—102 H. P. driving 9 B Wilbraham-Green Exhauster	2 hrs. delivering 175 M. @ 2.2 lbs. 13½ hrs. delivering 75 M. @ 1.15 lbs.	12.50
Pusher	14x12 Vertical Troy—102 H. P. driving 9 B Wilbraham-Green Pusher	5 hrs. delivering 80 M. @ 2.0 lbs. 8 hrs. delivering 45 M. @ 64 lbs.	6.30
Cond. Pump No. 1	10x10x12 American Marsh Simplex	Circulating water thru condenser—scrubber and cooling coils	6.80
Cond. Pump No. 2	10x10x12 American Marsh Simplex	Cooling water from holder to 2 condensers and scrubber cooling coils	3.50
Circulating Pump	3½x4x6 Davidson Simplex	Circulating water to wash box	2.20
Oil Pump	4x5x8 Davidson Simplex	Oil to sets	1.38
Drip Pump	4½x2¾x4 Blake Duplex	Pumping all drips between set and purifiers	.70
Stack Pump	4½x2¾x4 Blake Duplex	Boosting water pressure to Hyd. stack valve	2.00
Elevator	Craig-Ridgeway Steam Hydraulic	Generator fuel to floor	.62
Condensation	All traps		.44
Total			87.64

For the sake of analysis the following table is given in which I have averaged the two U. G. I. plants; the Charleston figures are not changed; and the water gas figures of Atlanta are isolated as far as possible from the coal gas figures. This table is given not so much for comparison as for study.

	Atlanta	U. G. I.	Charleston
Water gas	35.00	31.00	37.00
Blower	0.0	18.00	14.20
Exhauster	6.70	9.50	12.50
Mixed gas exhauster	3.00		
Pusher	10.00	3.80	6.30
Condenser pump	3.10	3.00	6.80
Condenser pump			3.50
Circulating pump		2.75	2.20
Oil pump	1.56	1.18	1.38
Stack pump	2.57		2.00
Elevator	.70	.38	.62
Steam traps	2.25	2.04	.44
Feed pump	5.00	2.86	
Drip	2.05	.23	.70
Tar pump	.29	.14	
Miscellaneous		2.00	
	72.22	76.78	87.64

The quality of steam required for making water gas is shown on this table from 31 lbs. to 37 lbs. With good hard oven coke the lower figure can be obtained but as the coke falls off in quality the consumption of steam will increase, and with poor wet coke one will find the steam running up over 40 and possibly 50 lbs. per thousand.

The steam used by the blower engine will, of course, vary with the efficiency of the engine driving the blower. Atlanta uses electric current and no steam is shown on the table under this heading.

The steam used by the exhauster engine will vary, of course, with the efficiency of the engine and with the amount of work required of this engine. This depends on the gas outlet pressure. In the case of Atlanta, the exhausters are helped out by means of a second exhauster or puller situated beyond all the purifiers, meters, etc., on the inlet main to storage holders. Therefore, the Atlanta exhausters and mixed gas exhausters should be taken together.

In the case of steam used by pushers, Atlanta looks high, but this item depends altogether on the proportion of gas handled by the pushers and the pressure.

Watch Condensation

The other items need no particular comment except perhaps steam traps and feed pump. We want to be careful not to let too much steam condense to be handled by the traps. Ample protection of the steam pipes will reduce this figure. The steam used by the feed pump in Atlanta looks high compared with U. G. I. plants, but since this table was made up a centrifugal turbine driven feed pump has been installed.

This table accounts for only 72 lbs. of the 96 lbs. per thousand feet of mixed gas used at Atlanta. The tar dehydrator, waste heat turbine and a number of pumps make up for this difference.

It is evident from the foregoing that we must use as little steam as possible—that is for a given amount of work the steam units should be economical. We should cut out any extravagant use of steam, we should correct all leaks, prevent condensation and use exhaust steam.

The proper utilization of exhaust steam has an effect on the selection of the steam units.

It is more economical to use exhaust steam for heating the feed water than to increase the economy of the engine by running it condensing.

Condensing engines need not be introduced until all of the exhaust steam of non-condensing units has been utilized and exhaust steam is escaping to the air.

Can Use Exhaust Steam

It is entirely practicable to use exhaust steam in water gas generators. An exhaust steam header of proper size (much larger of course than a live steam line) is run to the generator house and 5 or 6 pounds back pressure is maintained on this. The steam connections to the generator are large enough to admit the necessary steam in the usual time. The steam in this case can perform a double duty. For instance, a fan blower for an 11 ft. generator will require about a 250 H. P. steam turbine, if this turbine requires 55 lbs. of steam per H. P. per hour it will exhaust 230 lbs. per minute or enough steam to make 6000 ft. of gas per minute or ample to run the 11 ft. generator. Two sets would have to be in operation to make this steam available.

Discussing the use of steam in a water gas generator naturally brings up the matter of waste heat boilers on water gas apparatus. Such boilers have been in use for a number of years—fully long enough to demonstrate their practicability and economy.

The single vertical boiler using the blast gases only will develop 30 lbs. of steam per 1000 ft. of gas made. This is nearly enough steam to make the gas and if made in the boilers the 30 lbs. would cost about 1c. For each million feet of water gas made per day the saving would be $3,650.00 per year. This would be a handsome return on the investment in a waste heat boiler.

The double waste heat boilers on water gas sets utilizing both blast gas and illuminating gas develop 60 lbs. of steam per 1000 ft. of gas made and while these require more attention to keep up their efficiency, they are sources of economy.

In Atlanta the waste gases from the coal gas benches attracted our attention as a possible source of heat for producing steam. We run from 7 to 10 benches of 9's and the waste gasses enter the stack at 1000 to 1100 degrees.

I found that certain authorities stated that with waste gases at 1000 degrees, 2 lbs. of water should be evaporated per pound of bench fuel, when these waste gases were utilized in a well designed boiler. This would give us around 140 H. P. of boiler capacity. This matter was turned over to the Babcock-Wilcox Company and they installed a regular B. & W. boiler, 18 tubes high, 6 tubes wide, 16 ft. long with 1884 sq. ft. of heating surface.

To maintain the proper draft on the benches and through the boiler a turbine driven fan was installed on the discharge from the boiler. The steam turbine absorbs about 65 H. P. of the waste heat boiler—but even at that we save $4,000.00 a year in boiler fuel by means of this boiler.

In figuring on the saving to be effected by producing steam by waste heat or in substituting electric motors for steam units it is very necessary to know the exact cost of steam.

In Atlanta we have evolved a boiler record that gives the daily operating figures and the monthly cost of steam. The following headings appear across the top of the sheet and under these I have given the average figures for January, 1923:

% CO^2 in Stack Gases						
No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
9.2		9.3		10.3	9.4	9.7

Boiler Fuel						
Gas	Coal	Steam Coal	Breeze	Gen. Scr.	Retort Scr.	Tar
35117			24130			

Waste Heat Boilers			
Water Gas		Coal Gas	
Lbs. Evap.	B. H. P.	Lbs. Evap.	B. H. P.
		99041	120

Analyses		
Volatile	Fixed C.	Ash

	Cost of Steam	Cost per 1000 lbs.		Boiler Cleaned
Fuel	$3,781.02	.2188	No. 1	
Water	19.98	.00115	No. 2	
Labor	781.20	.0452	No. 3	
Perolin	56.20	.00324	No. 4	
Repairs			No. 5	
Misc.			No. 6	1–22–23
			No. 7	1– 9–23
Total	$4,638.30	.26839		

The cost of steam is a considerable factor in the cost of gas. In the Atlanta gas works steam costs about $40,000.00 per year.

The boiler plant at any gas works should receive a very great deal of study and consideration. The boiler units should not be too large. At least two boilers should be in use in any plant where a few hours' shutdown at any time would endanger the supply, or where gas pushers, boosters or compressors are operated by steam engines. An accident to one boiler should not be allowed to endanger the steam supply and therefore two boilers or more should be in use.

It is not the object of this paper to specify kinds of boilers. There are many good boilers to be had and sound engineering advice is furnished by the experts of the different builders of boilers. Many good books and articles on boiler design, etc., are available and to go into those matters here would be needless repetition.

If a new boiler is to be installed it would be well to investigate the advantage of automatic stokers, with complete automatic control of damper, speed of fuel feed, volume of air, etc. Also a suitable soot blower should be installed and automatic control of feed water. If all these are desirable in other places, why not in a gas works? If white enamel brick is the best facing for boiler settings because it retards radiation, why do we see so little white enamel brick on gas works boilers?

Make an Investigation

Most of us have boiler plants that possibly will not be enlarged at once. This, however, is no reason why a rigid investigation of all the boiler conditions should not be made. No matter how large or how small the boiler may be, its physical condition should be good. The brick setting can be made air tight by coating it with a mixture of tar and asbestos fibre. Air leaks around the iron doors, etc., can be stopped. Go over the whole setting with a candle and see where the flame is pulled in. Be sure that the blow-off cocks are not leaking.

Stack Gas Temp. °F.						
No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
510		509			501	471

Water Evaporated			
Total	Total Lbs. Evap.		Lbs. per M. Gas
59247	557279		103

Hand Fired Boilers				Ash	
Lbs. Evap.	B. H. P.		Lbs. Evap. per lb. fuel	Total	%
464562	569		7.9	7831	13.2
Remarks					

Try different ways of firing, even if this does disturb the theories of your fireman. Use the damper in the stack. Be sure the stack guys are sound and well secured. It would be most embarrassing to have the stack blow down. Examine the ashes that are carried to the dump. A lot of good fuel may be mixed with the ashes.

I make a practice of taking a sample daily from the ashes and analysing a 7 day composite sample each week. The average carbon in the ashes for 8 weeks was 26.2%. This was from under hand stoker grates.

I have a report of the analyses of ashes under several styles of regular stokers in a large gas plant as follows:

	A	B	C	D
Volatile	4.1	3.7	3.1	4.1
Fixed Carbon	19.4	27.8	17.8	28.0
Ash	76.5	68.5	79.1	67.9
	100.0	100.0	100.0	100.0

The coal used ran 8.5% to 10.7% ash.

I do not intend to go into details of operating boilers, but there are certain safeguards that should be mentioned.

If the boilers are arranged in a battery and a boiler is cut out for internal inspection it must be made impossible for steam to enter from the main header, or for blow-off water from another boiler to enter while a man is inside. The valve on top should be padlocked and a short flanged section of the blow-off pipe should be removed before a man is allowed to enter.

Also the safety valve discharges should be piped upwards above a man's head and not shoot steam across the tops of the boilers.

If the boiler plant is too small for occasional heavy peak loads, it can be reinforced by running an oil line to the boilers and providing sprays. These can be used in emergencies to keep up the steam pressure. The oil line should be valved off where it leaves the main oil line to relieve the emergency line of pressure except when needed.

I sent out a list of questions relative to steam production to 130 gas companies in the Southern States and I received 46 replies. Of the 46 plants I found

2 have waste heat boilers.
6 burn oil.
20 weigh boiler fuel.
6 measure the water.
21 heat and water.
29 cover the steam pipes.

There is evidently room for improvement in the operation of many of these steam plants.

The American Society of Mechanical Engineers has defined a boiler horse power as equal to converting 34½ lbs. of water per hour at 212 degrees into steam at 212 degrees. This is equivalent to 30.018 lbs. of water per hour at 100 degrees converted into steam at 70 lbs. pressure.

The horse power of a boiler is also rated by its heating surface, 10 sq. ft. representing a horse power. The rated horse power of a boiler has no particular significance as a limit to its capacity as a horizontal tubular boiler can be run safely and efficiently at 50% above its rating and a water tube boiler at 100% above.

Running a boiler above its rated capacity is generally called "overload", but the term implies a strain above normal conditions that really does not exist.

The term horse power as applied to boilers will have to be retained as a measure of size, or heating surface, but not as a correct designation of its capacity.

Some of the losses that prevent high efficiency in operating a boiler arise from the following causes:

Loss of fuel through the grate bars or in small particles over the bridge wall.
Moisture in the fuel.
Moisture in the air.
Heat carried away in flue gases.
Incomplete combustion to CO instead of CO^2.
Radiation from the setting.

In good practice the boiler will absorb 70 to 76% of the heat developed.

The saving effected by heating the feed water is considerable—about 1% of the fuel is saved for each 11 degree rise in the feed water. Raising the temperature from 68 degrees to 205 degrees will save 1-8 of the boiler fuel.

The saving effected by covering the steam lines properly is very important. According to a paper read before the American Society of of Mechanical Engineers in December, 1918, the monthly saving in boiler fuel at $5.00 per ton per 100 ft. of steam pipe covered with 85% magnesia covering steam pressure 100 lbs. is for

1″ pipe, $4.80 per month.
2″ pipe, $7.63 per month.
3″ pipe, $10.90 per month.

In conclusion, I wish to urge more consideration for the boiler plants.

I was recently in a large water gas plant where every modern device was used on the water gas sets, but the boiler plant—a large one—was devoid of modern improvements. On the other hand, I recently visited several works where the boiler plants were the show places of the works. Let us all work towards this end.

Heat Water with Gas*

NOT HARD TO ESTIMATE THE MARKET

By L. E. Spear, Kalamazoo, Mich.

The slogan "Cook with Gas" has lived for many years. What has been accomplished under its inspiration is an outstanding feature in the evidence that some 7,000,000 people in this United States are Cooking with Gas, and the end is not yet.

Constantly we are reading statistics about the unsold water heater market, only about 1½ Gas Water Heaters of all types in use, to every eight meters. It is not a hard job to estimate the tremendous market for the sale of Gas Water Heaters and to build up a load on present lines, services and meters, at little or no additional capital investment, a business that is steady month after month, and year after year.

The "Unprofitable customer" is a much talked of person these days, every Gas Company has its share of this kind of consumers to the extent that the "dead line" of business in many cases, is just barely reached because of the cost of the small gas consumer.

The generally accepted average monthly gas consumption from an automatic instantaneous gas water heater is 3,200 cubic feet; from an automatic storage gas water heater 3,700 cubic feet; and from a tank water heater, 500 cubic feet. It is evident, therefore, that the automatic instantaneous or the automatic storage heaters will be of greatest aid in changing the percentage of unprofitable consumers.

*Paper read before Iowa District Gas Association.

The tank water heater will alter only in a mild way the great percentage of small gas consumers.

The several surveys which have been made are convincing as to the promises of increasing send-out, by the sale of automatic gas water heaters. It is the appliance which fills the greatest unsold market, and is adaptable to all classes of consumers. "Heat Water by Gas" should be the slogan with every gas company; because, increased gas consumption by present consumers is more desirable than sales secured from new consumers which entail additional capital expenditures.

Of such large importance is this, that the American Gas Association has urged member companies to make the sale of automatic gas water heaters a "continuous and major effort". The worth of this great unsold market needs no more emphasis—it is too self-evident—but—how about the other fellow,—the user—the millions who are to fill in this picture? Will they profit too? The question almost answers itself.

You are aware of the large sales already made, and that are constantly being made of washing machines. These are labor saving devices as compared with hand labor, but are they worth their first cost, the cost of operation, and their maintenance cost? The electric man says they are—says so very positively, and sells them. Buyers are pleased with them.

By comparison where do we stand with automatic gas water heaters? We have the means to make the washing machine as useful as it can be; it is useless without hot water. Yet we have not put over that more fundamental idea "Heat Water with Gas" and "automatic gas water heaters." More people than we realize, and are probably ready to admit, stumble along day by day, and year after year. with a laborious, troublesome, scanty hot water supply that is never ready and never enough.

We can give them automatic gas water heaters.

Once connected, nothing else in the home is called upon so often or for so much service; nothing else pays such returns, not to just the wash-woman, or the maid, but to the "whole family," in time, labor savings, and in comfort, health and satisfaction. A healthful, daily bath for every member of the family becomes a care free pleasure. All this at a cost less than if provided by other means. The automatic gas water heater is a sound, economical convenience for use all the year round. Contrary to what many owners of coal water heaters will tell you, the smallest size coal water heater requires no less than 1,000 pounds of coal per month to keep it in continuous service and at $16 per ton, that is $8 per month. Compare that with the cost of 3,200 cubic feet of gas.

Value Needs No Apology

Value needs no apology and certainly in both service and cost of operation, no one has such supreme value to offer as is found in the service and cost of operation of an automatic gas water heater. How shall we sell them? First of all, we must know; We must sell ourselves so that we speak from experience,—officers, directors, department heads and employees, should all be users, for if we are to put over thoroughly the idea of "Heat Water with Gas" our own business families must be the starting point. Why shouldn't they be? Nothing else will give them the service so easily, so abundantly, and so cheaply. There are types and sizes for all; for the small compact modern home as well as the larger one. Do we ever hear the coal man say he doesn't use coal because it is expensive? No, indeed! Yet that is about the attitude of many in the gas business towards their own business. That attitude is changing to be sure but to make automatic gas heaters a successful "continuous major effort" there must be more change, the whole organization from top to bottom must understand and have the idea of "Heat Water with Gas." Do that as you do in selling the organization the idea of customer ownership securities.

When the size of gas bill is mentioned, there is no reason to ask a customer "Do you use an automatic water heater." Sell the service from automatic gas water heaters just as the telephone people have sold the telephone bill. With this done, there are other needs. Having decided upon a reliable, known line that has demonstrated its lasting qualities to merit your confidence; make a pretentious display; one consisting of a full line of types and sizes, arranged so it will convey to everyone who sees it that automatic gas water heaters are something of outstanding importance. Too many water heater displays are small and unattractive, with an appearance that instead of creating confidence and desire, express quite the opposite. Move the water heater display in front. Make it unavoidably prominent. Give water heaters the space they rightfully deserve, if you believe in a "continuous and major effort." Line up all the plumbers and sell them the idea "heat water with gas." Get the benefit of the additional publicity and prominence that will accrue from the use of plumbing stores as places for gas water heater display. Tie up with the efforts of the Plumbers Trade Extension Bureau, in their nation-wide campaigns, "A Bath in Every Home"—"Hot Water for Every Need" and "A Bath a Day". The plumbers are interested now, and their interest is growing.

Individually each plumbing and heating dealer may not have a great influence on the volume of gas water heater sales, but collectively the influence of the plumbers is a big factor and their total sales can be made to reach a substantial volume. Because plumbers have no interest in any appliances, except from the merchandising stand-point, any arrangement entered into with the plumbers must be beneficial to them as well as to the gas company. Getting orders requires salesmanship.

No Easy Road

There is no easy road to business in selling automatic gas water heaters. It is work—constant, consistent and persistent work. There must be someone in charge of automatic gas water heater sales; someone able to decide the best type and size for every job; able to match the hot water need with the proper equipment; able too, to post others, that the whole organization may be able to intelligently assist and be kept sold on "Heat Water with Gas" if a "Continuous and Major Effort" is made instead of occasional and temporary efforts.

Such a map can make efforts continuous and can secure business the year round. He can offer steady employment that will make automatic water heater selling attractive to salesmen.

The Question of Advertising

This brings us up to the question of advertising. Probably 60 per cent of your newspaper advertising is devoted to "Cook with Gas." Wouldn't it be well to make a nice change and devote a substantial part of newspaper advertising to "heat water with gas?"

The need of constant advertising in all the ways so well known to all of you needs no comment. Too much of it cannot be done if you are to put over the idea of "Heat Water with Gas" through automatic gas water heaters. The more you tell the quicker you sell, as the great Chicago Tribune says and proves.

There is just one point in connection with advertising, and that is prospect lists for use in circulating and in canvassing sales work.

In endeavoring this year to locate prospect lists, it was quite amazing to find what rarities, accurately kept up prospect lists really were, and yet such a list, is of such great value, as to recommend its having the utmost care and attention, and to thoroughly justify all the effort and expense necessary to keeping it up.

It is my belief that in making "Heat Water with Gas" in automatic gas water heaters, a "continuous and major effort"—because "You can do it better with Gas," the idea can be put over until 100 per cent of the gas consumers are doing it.

A Gas Rate Schedule*

FORM A PROPER RATE SHOULD TAKE

By J. B. Hill, General Manager Lincoln Gas and Electric Light Co., Lincoln, Neb.

It is not the purpose of this paper to solve any particular rate difficulties for any individual gas company or to attempt to say, intimate or calculate the amount any gas company should charge for gas; hovere it is the intent and purpose of this paper to

(a) Set forth some fundamental principles which should be observed in making a rate schedule, and

(b) Discuss the form or character of a proper rate schedule.

There are two fundamental principles that should be observed in determining a gas rate schedule, namely:

1st. The rate should be reasonable, and sufficient to yield an income at least equal to the outgo, i. e., the rate should yield an annual revenue equal to:

(a) Operating expenses including taxes, insurance, etc., incurred by good and efficient management, plus

(b) An adequate depreciation allowance, plus

(c) Interest on the investment in the property required to manufacture and distribute the gas, i. e., to supply the service, plus

(d) A reasonable profit high enough to attract capital into the gas industry.

2nd. The rate schedule should be correct as to form.

The form of schedule should be such as—

(a) Be just and non-discriminatory, i. e., will be equally fair to the utility and to each individual customer to the end that the company be not required to serve a certain class or classes of customers at a loss and a certain class or classes of customers be not required to pay for the loss or costs caused by another class or classes.

(b) Tend to contribute to the use of gas, i. e., build up the business by causing those now using gas to use more and those who do not use gas to become users.

The gas industry is an old one—at least old in comparison to the electrical industry. In practically every city where the two industries operate, the gas company was in existence and had an established business at the time the electric company was in process of formation. I believe it is agreed, by those who have given the matter thought, that if the ordinary rank and file of domestic customers could be forced to choose between gas service and electric service, the great majority of customers would choose gas as being the more necessary to their comfort—because they can light, heat and cook with it at a less first cost for equipment—if for no other reason. From the standpoint of age, desirability of service, and large number of customers; the gas company has had in the past, a decided advantage over the electric company; and I believe still has opportunities equal to those of the electric company if not some advantages. However, from the history of the two utilities it is found that electric companies have grown by leaps and bounds as compared with gas companies and the financial results from the sale of electricity have been by far more satisfactory to investors than have been the results of the gas companies. This is no doubt due to the fact that the electrical industry has developed many different forms of rate schedules and has placed these rate schedules in use and experimented with them, whereas the gas industry has practically been content to stick to one form of rate schedule, namely the straight meter rate.

(*Continued on Page* 408)

*Paper read before Iowa District Gas Association.

As the Journal Views It

AN OPPRESSIVE LAW

"Because it probably will be embarrassing to members of the opposing political party." That was the reason advanced by one New York newspaper for the passing by the New York State Legislature of a bill designed to provide that the rate for gas in Greater New York City should not exceed one dollar. This newspaper asserted that this view was expressed by one of the law-makers after the session had been completed. He based his opinion, it was said by the newspaper, on the fact that he and several of his fellows believed that the law would be declared unconstitutional by the courts.

Perhaps this example shows as clearly as any that could be cited just how public utilities are regarded by a certain class of politician. They do not stop to think of the expense involved in having such a question settled nor are they willing to take into consideration the fact that ultimately it is the consumer who will have to pay for the litigation that necessarily must ensue.

The law was passed within a few months after the United States Supreme Court had declared that a former law much the same in its sections, although fixing a lower rate, was confiscatory and unconstitutional. It tooks years to get this through the courts and to obtain a final decision, and in the meantime many politicians had made political capital out of their attacks on the public utility. And in addition there was added to the burden of the gas companies a great deal of unnecessary work and expense that might have interfered with the service rendered. It certainly did interfere in some cases with the securing of much needed additional capital.

But there is no dissecting the political mind. Those who were short sighted enough to have voted for it did not also consider that their votes might react as unfavorably to their political fortunes as will those cast by the members of the opposing political party. We believe that this new measure, which will become a law when Governor Smith signs the bill, is confiscatory and unconstitutional and will be so declared by the courts. We know that gas companies are striving constantly to render the most efficient service possible at the lowest possible rate and when it has been found impossible to give service at rates prescribed by law, then the courts have a way of upsetting laws. Courts are for the protection of the public, although many of the lawmakers seem to feel that this is not the mission of the judiciary.

GASMEN AGAIN PROVE THEIR LOYALTY

Another tribute has been paid to the unfailing loyalty of members of the gas industry. This time it was employees of the Atlantic City Gas Company who were the subjects of praise by newspapers. This praise came after an accident in the plant of the company that threatened the lives and well-being of the residents of that resort except for the prompt work of the men who remained on their jobs and fought through until all danger had passed. But this did not alone satisfy the company, for, under the direction of the general manager, repairs were started so quickly that the service was interfered with for only a minimum length of time. It is said that, taking into consideration the nature of the accident, the plant was back in service in record time.

In view of the many demonstrations of faithfulness and bravery that have been given by gasmen of every degree, it is hard to understand the attitude of certain parts of the public we serve. These people are constantly attacking companies for their negligence and asserting that the gasman has the easiest kind of job. No education or record seems to be able to overcome this attitude. Nor have the newspapers as a general thing been willing to give credit when credit is due to the gas company. It speaks well for the Atlantic City Gas Company that one of its local dailies should freely express its appreciation for this unswerving loyalty. Surely this gas company has made an impression by its attitude toward the public it serves.

During the past year or so there have been wonderful records made by gas company men, but in only a few cases have newspapers given them credit. But let the company or its men err in even the slightest degree, and there is instantly set up an attack that is extremely bitter, to say the least.

We know that the public is fair, but sometimes it is hard to believe that those who have taken unto themselves the task of acting as mouthpieces realize that this is the general attitude.

A Gas Rate Schedule

(Continued from Page 406)

Arriving at a Rate

The average gas company, in arriving at a rate, takes the total operating expense for a given period, or rather total cost to deliver gas to the meters to which is added interest charges and an allowance for depreciation (in past years this latter item was sometimes forgotten). This sum is then divided by the gas sales for the period or by the anticipated sales for a similar period. The result has been with few exceptions, a straight meter rate of say $1.50 (more or less) per 1,000 cu. ft.

Analysis of the bills being paid by gas consumers show that from 30 per cent to 50 per cent are being served at a loss to the gas company, some of the remaining consumers pay about what they should pay and others pay an excessive rate for the service they receive. (Analysis of the Grand Rapids Gas Light Co.'s customers show that about one-third fall in each class. This analysis also shows that among the profitable consumers who bore the burden of the others, were found the families of moderate means, while those who failed to pay their share consisted in a large measure of tenants of office buildings and apartments, where little cooking was done.)

Present Rates Unfair

Gas rate schedules in the past and at the present time, with few exceptions, are discriminatory and unfair. No theory seems to be involved other than, in general, the income should at least equal the outgo. As a result of the discriminatory form of rate schedule and the failure to give consideration to better rate forms, the gas companies have been unable to secure the better load factor that the use of gas for industrial purposes would have given them—in other words they have been unable to secure industrial business which we all agree is necessary if our gas companies are to progress and prosper to the fullest extent.

Without taking up and discussing the many different forms of rate schedules I am going to point out a form of rate schedule which is fundamentally correct. I will discuss this rate briefly and merge it into what is, in my judgment, a practical gas rate schedule. I have in mind the Doherty Three-Part Rate Schedule which consists of:

(a) A Customer Charge, plus
(b) A Demand Charge, plus
(c) A Commodity or Output Charge.

The Customer Charge is for such costs which are caused directly by the customers without consideration of the demand and consumption. It covers such costs as reading meters, billing, fixed charges and maintenance on meters and fixed charges and maintenance on part of the distribution mains (2" equivalent of total length of mains—approx. 1/3). The customer charge is obtained by adding all these costs together and dividing by the number of customers. A reasonable profit should be added. It will be the same in amount for all customers regardless of size of demand or quantity of gas used. This charge is in form of so much per year or month per customer.

The Demand Charge is for such costs which are caused by the maximum hourly rate of gas used by a customer. It covers fixed charges on plant, fixed charges and maintenance on part of distribution mains not charged under customers charge. (All over 2" equivalent—approx. 2/3) and certain fixed labor charges. The demand charge is obtained by multiplying the ratio of the customer's demand to the total demand by the total demand charge expense. A reasonable profit should be added. The customer's demand may be obtained by some form of demand meter or proportioned on the basis of size of meter. This charge is in the form of so much per year or month per foot of maximum demand.

The Output Charge

The Commodity or Output Charge is for gas. It might be called a consumption charge. It covers the works operating and maintenance costs, materials, labor and certain carrying costs caused by materials in stock, that is, all costs which vary with quantity of production. This charge is obtained by dividing the total charge by the gas sales. A reasonable profit should be added. This charge is in the form of so much per 1,000 cu. ft. used.

The objection to the Three Part rate is the difficulty of dividing the costs between the Customer Charge and Demand Charge, however this objection is of minor importance compared to the difficulty of getting the public to understand the rate schedule. For this reason I believe it advisable to combine the Customer charge with the Demand charge thus making a Two Part Rate, namely:

(a) Readiness to serve or Service Charge, plus
(b) A Commodity or Output Charge.

The Readiness to Serve or Service Charge to include all fixed charges, namely, interest, depreciation and certain fixed operating charges such as labor and customer charges, plus a reasonable profit. This charge to be distributed to customers based upon size of meters installed.

An Example

The Commodity or Output Charge to be the same as obtained under the Three Part Rate—with a reasonable profit added.

For example—let us assume a Commodity Charge of 80 cents per 1,000 cu. ft. Mr. A has a Readiness to Serve or a Service Charge of $1 per month and Mr. B. a Service Charge of $2 per month. (His meter being twice as large as Mr. A's).

On basis each used 500 cu. ft. gas per month.

	Mr. A	Mr. B.
Service Charge	1.00	2.00
Commodity Charge of 80c.	.40	.40
Monthly Bill	1.40	2.40

Average Rate per 1,000 cu. ft.	2.80	4.80

On basis each uses 1,000 cu. ft. gas per month.

	Mr. A	Mr. B
Service Charge	1.00	2.00
Commodity Charge of 80c.	.80	.80
Monthly Bill	1.80	2.80
Average Rate per 1,000 cu. ft.	1.80	2.80

On basis each used 2,000 cu. ft. gas per month.

	Mr. A.	Mr. B
Service Charge	1.00	2.00
Commodity Charges @ 80c.	1.60	1.60
Monthly Bill	2.60	3.60
Average Rate per 1,000 cu. ft.	1.30	1.80

On basis each used 4,000 cu. ft. gas per month.

	Mr. A.	Mr. B
Service Charge	1.00	2.00
Commodity Charge @ 80c.	3.20	3.20
Monthly Bill	4.20	5.20
Average Rate per 1,000 cu. ft.	1.05	1.30

Analysis of the above example shows that the rate schedule is equitable to the customer and the company, as the average rate becomes less when more gas is used, and the average rate becomes excessive when very little gas is used.

In other to establish the Two Part Rate, it will be necessary to enlighten the public through a campaign of education; however, I believe, in due time, this form of rate will receive very favorable consideration from both the companies and the public because:

(1) It is simple in form.
(2) It is based upon sound fundamental principles.
(3) It gives a fair and just distribution of charges to all classes of consumers.
(4) It encourages the use of gas.
(5) It gives every consumer an opportunity to obtain a low average rate.
(6) It has the backing of the Commission and the Courts.
(7) It will enable gas companies to obtain and satisfy industrial business which under the present form of rate schedules cannot be done.

An Analysis of the House Heating Load*

A PRESENTATION OF THE VARIOUS FACTORS THAT ENTER INTO THIS PROBLEM

By N. T. Sellman, Assistant Secretary-Manager, American Gas Association

The gas industry is at present in a very interesting stage of development; new uses for gas are being sought and an increased effort is urged to bring about the more general use of gas in those instances where our success is still questioned. One phase of this development that is receiving considerable attention is the more general use of gas for house heating purposes.

The application of gas to space heating is almost as old as the industry, and the only new phase involved is its exclusive use for house heating, either by means of a central heating plant or small individual room heaters. Practically every gas company has countenanced, without serious thought, the sale of small heaters, presumably for auxiliary use and they only raise the question about the desirability of the heating load when it involves the use of gas as the sole source of heat for a building. Upon careful investigation we will find that the auxiliary heaters are not used exclusively for fall and spring heating but fully as much as boosters for inadequate central coal heating plants during the extreme cold waves. Furthermore, the daily send out of most large gas companies shows that the consumption of gas is inversely proportional to the temperature, with the rate of increase greatest at the extremely low temperatures. This can only indicate that many heaters are used only at these periods and that even ranges and lights are brought into service as auxiliary sources of heat.

*Paper presented at Eastern States Gas Conference.

Since gas is being considered more than ever as a fuel, it does not seem consistent to hesitate in developing its largest field of expansion, particularly when it is an application that suits the purpose so well that the public use it in spite of makeshift appliances and other inconveniences. However, before proceeding to give some comparative figures to justify my views, I wish to recommend that if heating is to be encouraged through the sale of appliances for this purpose, it might then be most satisfactorily accomplished by central heating boilers, properly installed and flue connected. By doing this we are at least making installations of which we can be proud and which will, through the satisfactory service they render, pave the way for the more general use of gas for other purposes.

In order to enable each gas man to study his own local situation, I will show just how the local weather reports can be used to estimate the gas consumption for each prospective installation and how the exact temperature readings can be used to check gas bills, and, when necessary, satisfy consumers where it appears that they have received a high gas bill.

I will also give a few comparisons showing how the house heating load compares with other loads with which we are more familiar. All the concrete examples which I am quoting are based on data applicable to this vicinity (Eastern States), and the tables presented later in this paper will show how these examples and methods of calculation can be applied to any local condition.

As there are numerous efficient boilers on the market almost any of which will yield an efficiency of 80 per cent, this will be the efficiency assumed throughout. I am also assuming, in all my examples, a calorific value of 600 B. t. u's. On this basis we can allow exactly 2 square feet of boiler rating per cu. ft. of gas. Therefore, if we assume an installation having exactly 1,000 sq. ft. of steam radiation and allowing the customary 25 per cent for risers and returns and an additional 25 per cent for quick heating under thermostatic control, we find that this installation will call for a boiler having a rating of approximately 1,600 sq. ft. Dividing this by 2, it will give us the gas consumption of the boiler, namely 800 cu. ft. per hour.

For a boiler selected according to the above calculations, the burners will be in operation 15 hours on a day having a temperature of 0 deg. F. and therefore the consumption on this maximum day will be 12,000 cu. ft. During an average January, which is the coldest month, this consumption will be 211,000 cu. ft. and for the entire heating season, the consumption will be approximately 1,050,000 cu. ft.

Comparing the Consumption

Let us see how this yearly consumption compares with that derived from domestic gas ranges. The average range yields an annual consumption of 15,000 cu. ft.; therefore, if we divide the annual consumption from the assumed heating installation of 1,000 square feet by 15,000 we find that it will be necessary to install 70 gas ranges to produce an equivalent annual consumption.

The maximum hour demand of 70 gas ranges will be approximately at the rate of 30 cu. ft. per range, or 2,100 cu. ft. You will therefore see that to obtain the same annual sales of gas through gas ranges as we will get from the assumed heating installation, the maximum hour demand will be approximately 2½ times as great. In addition to increased service demand the 70 gas ranges will in many communities call for 70 independent services and 70 meters; even in the case of an apartment house containing 70 apartments, it would be necessary to supply the 70 meters and a service large enough to take care of 2½ times the maximum hourly consumption of the heating installation.

From these examples it is clear that from the standpoint of distribution, service and meters, the house heating installation is worthy of careful consideration. The only condition produced by house heating which should in any way raise a question is that of plant capacity, which is directly affected by the severity and duration of the coldest weather.

The worst condition that the weather records in this vicinity have ever shown is 3 consecutive days of 0 deg. temperature.

In the case of the installation which I have assumed, the maximum day will produce a consumption of 12,000 cu. ft., therefore for 3 such consecutive days this consumption will be 36,000 cu. ft. In the case of the gas ranges the gas consumption for an equivalent period of time will be approximately 200 cu. ft. per range which will produce a demand of 14,600 cu. ft. The ratio of the demand on the plant of the house heating installation is therefore 2.57 times greater than the range demand. As viewed from our present knowledge of the subject this phase of the house heating load may in some cases be

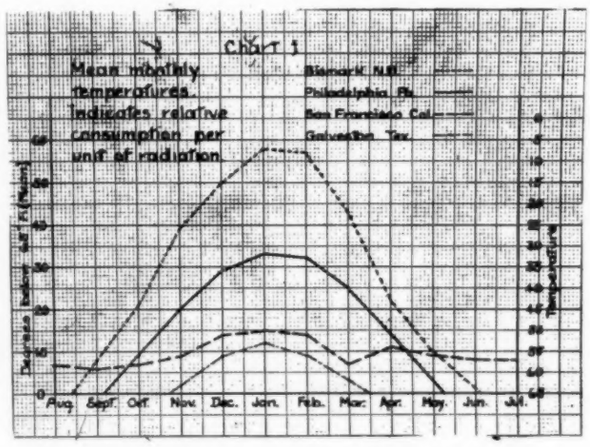


Chart 1
Mean monthly temperatures
Indicates relative consumption per unit of radiation
Bismarck N.D.
Philadelphia Pa.
San Francisco Cal.
Galveston Tex.
Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May. Jun. Jul.

serious enough to warrant all forms of space heating being discouraged, but the situation may be improved and this difficulty lessened by developing summer water heating, refrigeration and some industrials. It is along this line that our effort should be directed—and there is also deserving of your consideration the advisability of providing attractive rates for "off peak" consumption of this summer load character.

The few facts just stated regarding the house heating load are applicable to all conditions in proportion to the local weather conditions. The detailed study which is necessary for each local gas company to make involves, broadly, three considerations—first, what is the existing load? Second, what will be the exact nature of the local heating load, and third, what consumption can be developed that will tend to neutralize the effect of the heating load?

The first consideration that I have mentioned is one with which each gas company is already fully acquainted. The one most important factor in this consideration is—what is the present maximum day's send out and what is the ratio of this maximum day's send out to the yearly send out? Some gas companies are fortunate enough to have the maximum day's send out during a period not related to the heating load. A gas company having this situation should be able to undertake some house heating without further consideration.

Before I enter upon the second consideration, which is the one that I am attempting to present to you in detail, I will dispose of the third.

The Summer Load

The consumption which can be developed for strictly summer load or consumption which might vary directly with the temperature has received even less consideration than house heating. The possibility of refrigeration by gas is theoretically a most

logical counterpart to house heating. The demand for refrigerants is directly proportional to the temperature, whereas heating is inversely proportional to the temperature. The possibilities of summer water heating for large buildings must be realized. We have the appliances and the necessary data for aiding us to secure this attractive consumption. Recently several concerns have introduced to the plumbing trade water heaters which operate on gas in the summer and heat by means of the central boiler in the winter; these appliances can be used to advantage for developing summer load when the central boilers are heated by fuels other than gas.

Most industrials have a fairly uniform load and could only be induced to develop maximum summer demands through favorable rates. There are a few industries, however, which have a decided summer peak which we should make every effort to secure as gas consumers. Industries of this character are ice cream cones, cracker baking and beverages.

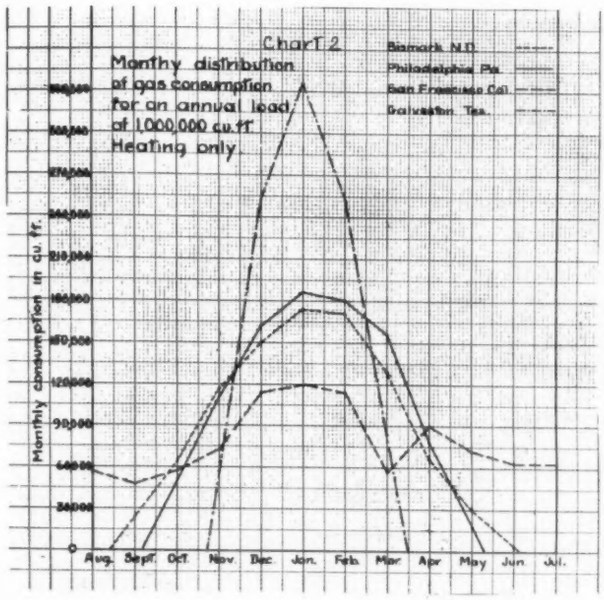
The second consideration in importance, which I have purposely left for a final and detailed study, is to most gas men a new one as it requires us to become familiar with all phases of the heating profession. The art of heating is now a comparatively exact science and is doubly so where gas is the fuel under thermostatic control. Such phases of heating, as estimating and locating the radiation, methods of piping risers and returns, and selecting from the various heating systems the one most suitable for each case are a study in themselves; fortunately these phases of heating do not require the gas man's detailed study.

The Responsibility of the Gas Industry

Our responsibility as gas men consists of supplying the correct boiler size, based on the radiation installed, of recommending the proper accessories and control devices and, before gas is turned on, making an inspection.

In order to select the correct boiler size we must know accurately what the boiler rating is under the local gas conditions. In order that all boilers will be rated on the same basis, the Committee on the Standardization of Gas Appliances has prepared a standard method of rating gas fired steam boilers which will be presented for the approval of the membership of the American Gas Association at its next annual convention.

Knowing the correct boiler rating, it is a simple matter to select the suitable boiler size by following the rule of adding to the exact amount of cast iron radiation the sq. ft. of radiation represented in risers and returns and adding to this total 25 per cent for quick heating when the boiler is operated under thermostatic control. In most cases the sq. ft. represented by risers and returns is proportionate to the sq. ft. of actual cast iron radiation and as a result it is common practice to simply add 25 per cent for risers and returns to the sq. ft. of cast iron radiation. The first method, however, is more accurate and should always be used where there appears to be an excessive amount of piping.



Must Know Local Weather Conditions

To facilitate selling house heating boilers we should have sufficient knowledge of our local weather conditions to enable us to estimate the probable gas consumption for the year for any given installation and we should also be able to apportion this gas consumption as it will be used from month to month. If we have this knowledge it can often be used to advantage in checking the consumptions of actual installations, thus determining whether or not they are operating properly, and occasionally this knowledge can aid us in accounting for apparently high gas bills caused by extremely cold periods. In this connection I have prepared the following table, which shows the monthly mean temperatures below 65 deg. for various cities throughout the United States.*

The reason that the monthly mean temperatures are given below 65 deg. is a matter that has been determined by experiment and from the data collected on many installations which prove conclusively that when the monthly mean temperature is 65 deg. we start to consume gas for heating purposes. Furthermore, tests show that the gas consumption varies inversely with the temperature; in other words, on a day when the temperature is 20 deg. below 65 deg. we will consume twice as much gas as on a day when the temperature is 10 deg. below 65 deg.

Allowing that these statements are true the gas consumption for performing any unit of heating will be proportional to the total number of "degree days" during the heating season where "degree days" represents the summation of the year's daily mean temperatures below 65 deg.

TABLE No. 1

Listed in Order of Heating Load —Monthly Mean Temperature Below 65° F.—

City	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total of Year	Per Cent Used in Maximum Month	Approximate Degree Days = Total × 30
Galveston	12	9	3	..	..	..	..	..	..	..	2	9	35	34.3	1050
Jacksonville	11	8	3	..	..	..	..	..	..	..	4	10	36	30.6	1080
New Orleans	12	9	3	..	..	..	..	..	..	..	4	11	39	30.8	1170
San Antonio	14	11	3	..	..	..	..	..	..	..	6	12	46	30.5	1380
Phoenix	15	11	5	..	..	..	..	..	..	..	6	13	50	30.0	1500
Los Angeles	11	10	8	6	3	..	..	..	..	..	5	9	52	21.2	1560
Charleston	16	13	8	1	..	..	..	..	..	..	7	14	59	27.1	1770
Dallas	20	16	8	1	..	..	..	..	..	..	9	19	73	27.4	2190
Atlanta	23	20	13	4	..	..	..	..	..	3	13	20	96	23.9	2880
Memphis	25	22	13	3	..	..	..	..	..	3	14	21	101	24.7	3030
San Francisco	15	14	7	11	9	8	8	7	6	7	9	14	115	13.0	3450
Oklahoma City	30	27	16	5	..	..	..	..	..	4	17	26	125	24.0	3750
Asheville	30	27	20	11	2	..	..	..	..	10	20	27	147	20.4	4410
Saint Louis	34	31	21	9	..	..	..	..	..	7	20	30	152	22.4	4560
Washington, D. C.	32	31	23	12	1	..	..	..	..	8	20	29	156	20.5	4680
Philadelphia	33	32	25	14	3	..	..	..	..	9	20	29	165	20.0	4950
Cincinnati	35	33	24	13	2	..	..	..	..	10	22	31	170	20.6	5100
Pittsburgh	34	33	25	14	2	..	..	..	..	10	22	30	170	20.0	5110
Seattle	26	25	21	16	10	5	1	2	7	14	21	24	172	15.0	5160
New York	35	34	27	17	6	..	..	..	..	9	21	31	180	19.4	5400
Kansas City	39	35	24	11	1	..	..	..	..	15	23	33	181	21.5	5430
Salt Lake City	36	32	24	15	7	..	..	..	..	13	25	33	185	19.5	5550
Denver	36	34	26	17	8	..	..	..	2	14	26	33	196	18.4	5880
Santa Fe	37	33	26	17	8	..	..	..	4	15	27	35	202	18.3	6060
Boston	38	37	30	20	8	..	..	..	2	13	24	33	205	18.5	6150
Cleveland	39	38	31	19	7	..	..	..	1	12	25	34	206	18.8	6180
Spokane	38	35	26	17	9	2	..	..	6	18	28	34	213	17.8	6390
Chicago	41	40	31	19	9	..	..	..	..	12	26	36	214	19.1	6420
Detroit	41	40	32	19	7	..	..	..	2	13	26	35	215	19.1	6450
Albany	43	41	33	19	6	..	..	..	3	15	27	37	224	19.1	6720
Buffalo	40	41	34	23	11	..	..	..	2	13	26	35	225	18.2	6750
Sioux City	49	45	32	17	4	..	..	..	1	14	31	42	235	20.8	7050
Helena	45	43	34	23	13	4	..	..	9	21	32	40	264	17.1	7920
St. Paul	53	50	37	19	7	..	..	..	5	17	34	46	268	19.8	8040
Bismarck	58	57	43	22	10	1	..	..	8	21	39	50	309	18.8	9270
Ideal Case	x	x	x	x	x	x	x	x	x	x	x	x	12x	8.3	365x

where x=65—Temp

Degree Days

For comparing the relative load of one city with another as shown in the table, it is sufficient if we assume every month to have 30 days and merely sum up the monthly mean temperatures below 65 deg., and multiply this total by 30 and in this manner obtain the approximate number of "degree days."

You will note from the table, that the heating load varies over a very wide range throughout the United States; Galveston, Texas, for example, has only 1,050 "degree days" during the season whereas Bismarck, N. D., has 9,270. Philadelphia, as might be expected, is approximately half-way between these two, having 4,950 "degree days."

Another very interesting point brought out by this table is the fact that the Southern cities have a poorer load factor than the Northern cities; for example, Galveston will consume during the month of January 34.3 per cent of the total amount of gas to be used during the entire year for heating, whereas Bismarck will use only 18.8 per cent during the same month. The city having the best load factor is San Francisco, Cal., where the maximum month is only 13 per cent of the yearly, and what is even more re-

markable, is the fact that heat will be required every month during the year. This latter feature is also true of Seattle, Washington.

Chart No. 1 shows graphically the relative heating loads for Bismarck, N. D.; Philadelphia, Pa.; San Francisco, Cal., and Galveston, Tex., and the curves obtained by plotting the mean monthly temperatures below 65 deg. also indicate the relative consumption per unit of radiation for these various cities.

Chart No. 2 represents a monthly distribution of gas consumption for the same four cities but for a total annual heating load of 1,000,000 cu. ft. of gas. These curves show clearly how the load for a Southern city, such as Galveston, is very much poorer than either Bismarck or Philadelphia. Here again you will note that the heating load for San Francisco is almost ideal.

Chart No. 3 gives the cu. ft. of gas per sq. ft. of radiation for the heating season for any climate, the climate being expressed in "degree days." A separate line for each even B. t. u. value, ranging from 400 to 1,000 B. t. u. makes this chart applicable for any heating condition in the United States.

The cu. ft. of gas per sq. ft. of radiation is expressed for both steam and hot water radiation. To show how this chart works, we will assume the case of Philadelphia where the approximate number of "degree days" is 4,950, as obtained from Table No. 1, and assume 600 B. t. u.'s per cu. ft. of gas. We find that it will require approximately 990 cu. ft. of gas per sq. ft. of steam radiation for the season, or 495 cu. ft. of gas per sq. ft. of hot water radiation for the season.

Goes Back Over Long Period

All the consumption estimates that I have presented up to this point are based on the average temperature conditions for periods ranging from twenty to fifty years. The estimates are therefore perfectly fair for an average winter, but may prove either high or low for any particular year. For example, the average number of "degree days" in New York below 65 deg. F. is 5,276. (Using the exact number of days in each month.) During the winter of 1917-1918 it was necessary to provide heat for 5,898 "degree days," while in the following winter of 1918-1919 there were only 4,636 "degree days." This means that during the winter of 1917-1918 the gas consumption per sq. ft. of steam radiation would be approximately 1,170 cu. ft. for the season, while in 1918-1919 the corresponding consumption would be approximately 920 cu. ft. whereas the average figure for New York City is 1,050 cu. ft.

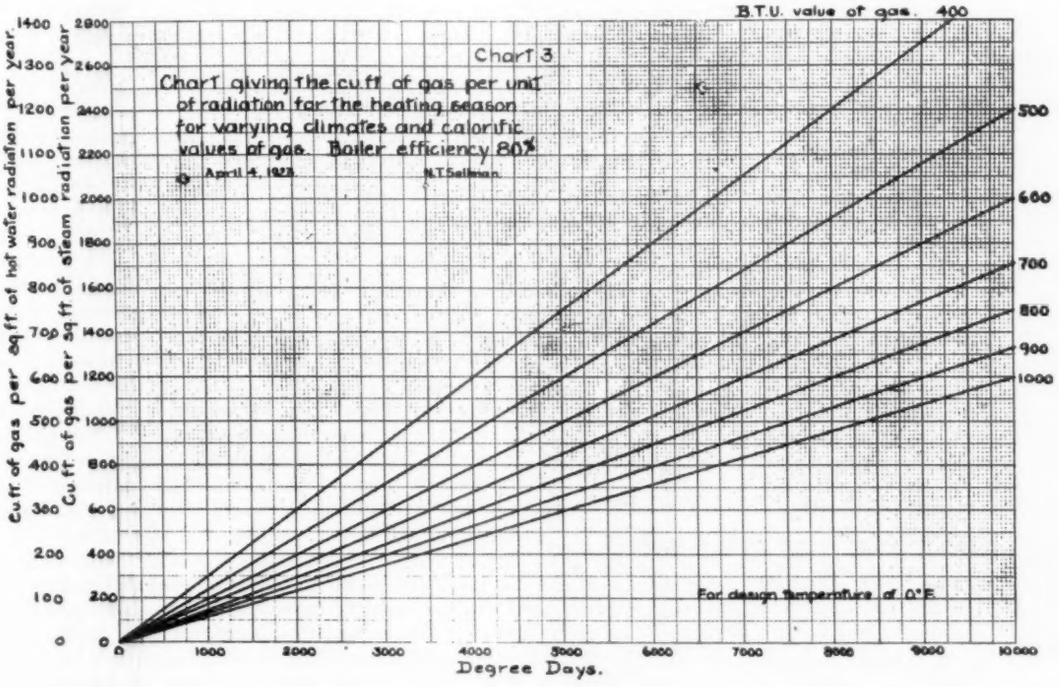


Chart 3
Chart giving the cu ft of gas per unit of radiation for the heating season for varying climates and calorific values of gas. Boiler efficiency 80%
April 4, 1923
N.T.Sellman
B.T.U. value of gas. 400
500
600
700
800
900
1000
For design temperature of 0°F.
Cu ft of gas per sq ft of hot water radiation per year
Cu ft of gas per sq ft of steam radiation per year
Degree Days.

The distribution of the cold weather during the winter months is also quite a variable and careful study of what may be expected will be helpful in explaining to customers what at first glance appears to be an excessive monthly consumption. For example, during an average winter, January will require 20.1 per cent of the total quantity of gas used for heating during the year. For an installation having 1,000 sq. ft. of steam radiation this will call for a gas consumption of 211,000 cu. ft. for this month. January, 1918, accounted for 22.9 per cent of the year's heating load and a corresponding consumption of 268,900 cu. ft. while in 1919, January accounted for 19.9 per cent and 183,500 cu. ft. When these facts are studied and understood it is an easy matter to explain satisfactorily an apparently high bill.

A poorly proportioned installation, over or under heating, a faulty thermostat and other defects can be determined by checking an installation against the temperature and your local unit consumption figures. A table similar to No. 2 should be made up by

TABLE NO. 2

		Monthly Mean Degrees Fahr. Below 65°			Summation of Daily Mean Degrees Fahr. Below 65°			Percentage of Gas Consumption by Months			Gas Consumption in Months in Cu. Ft. Based on 1,000 Sq. Ft. of Cast Iron Steam Radiation		
Month	Days	Winter 1917 1918	Winter 1918 1919	Average Since 1871	Winter 1917 1918	Winter 1918 1919	Average Since 1871	Winter 1917 1918	Winter 1918 1919	Average Since 1871	Winter 1917 1918	Winter 1918 1919	Average Since 1871
Sept.	10	2.0	2.2	...	20	22	...	.3	.5	.0	3500	4600	.....
Oct.	31	13.0	6.4	9.0	403	198	279	6.8	4.3	5.3	79800	39700	55700
Nov.	30	23.0	19.3	21.0	690	579	630	11.7	12.5	11.9	137200	115300	125000
Dec.	31	40.0	26.0	30.9	1240	806	958	21.1	17.4	18.1	247500	160500	190000
Jan.	31	43.4	29.8	34.2	1345	924	1060	22.9	19.9	20.1	268900	183500	211000
Feb.	28	35.4	30.3	34.3	991	848	960	16.8	18.3	18.2	197000	168800	191000
Mar.	31	23.8	23.0	26.8	738	713	831	12.5	15.4	15.8	146500	142000	166000
Apr.	30	15.2	16.2	16.1	456	486	483	7.7	10.4	9.2	90300	96000	96600
May	15	1.0	4.0	5.0	15	60	75	.2	1.3	1.4	2300	12000	14700
Total	237	...	...	...	5898	4636	5276	100.0	100.0	100.0	1173000	922400	1050000

each gas company for a unit block of radiation and added to each month after the temperatures from the weather bureau reports are secured. This can then be used to account for deviations from normal or average conditions.

House Heating Most Interesting

I am sure that you will find house heating a most interesting subject if followed and studied in this manner. It will result in satisfactory installations and I assure you that by doing this you are making friends for the gas company. We can never popularize or extend the use of gas unless the application is of such a character that its requirements can be fulfilled better with gas than with any other medium. This, fortunately, is the case in central house heating.

THE METER AND THE CONSUMER*

By Chas. W. Risley

One of the leading men of the Gas Industry is accredited with the statement: "The public is less concerned with the precise rate it pays than it is with having thoroughly efficient service." To apply this truth to my subject I will paraphrase it to read, The customer is less concerned with the meter than he is with having thoroughly efficient service.

To promote a more abiding confidence in the meter, we should diligently search for agencies and use those at hand that will educate customers in the knowledge of meter performance. Such propaganda reduces the number of complaints on incorrect registration and decreases the distrust in the minds of those who do complain. If complaints are followed by a thoroughly competent investigation much can be done in upbuilding good will. I have in mind three agencies that will conduce to this result:

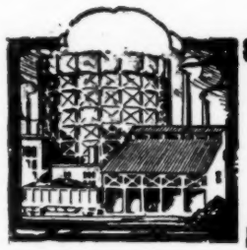
1. The wide distribution of the folder entitled "Truths About the Meter." This folder, prepared by the American Gas Association, contains excellent reading matter and illustrations. The text covers paragraphs on engineering and scientific research at the United States Patent Office and the Bureau of Standards at Washington, showing the gas meter passing searching requirements for nearly a century and stands today as the survival of the fittest among devices and instruments of measurement; also information on how to read a meter, description of the inner parts and construction of the meter, tests and certification before installation, and points on how to reduce bills. The illustrations show meter inspector proving meter and the testing apparatus, facsimile of dial and skeleton view. This booklet could be inserted in all correspondence relating to high bill complaints and placed on the Adjustment and Order counters, if not distributed to all consumers.

2. The use of the complaint meter in obstinate and chronic cases of dispute. This meter records the five-foot demands on a graphic chart covering period of one week; the number of upstrokes recorded multiplied by five indicating the hourly consumption. This device proved its effectiveness in a recent case, where a lawyer who frequently disputed bills and insisted upon the meter being changed each time, refused to pay his bill and demanded a meter test. The complaint meter was installed and after a week's record we showed him how the consumption on the customer's meter tallied with that on the complaint meter, and the graphic chart revealing a large consumption during the hours of both day and night. He was impressed and convinced and it was not necessary to change the meter.

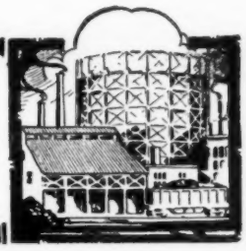
3. A special adjustment representative, whose duty it is to make investigations on the premises of complainant. This man should be carefully selected and possess a diversified background of experience, enabling him to advise customers regarding the appliances and meter and a personality and resourcefulness that wins the customers' confidence. Such a representative handling letters of complaint and important counter-complaints makes a survey of the appliances used, sees if they are operating properly, re-reads the meter, instructs on how to read the meter, and in some instances returns for a few days to ascertain the daily consumption. The facts thus obtained provide the premises for an explanation that satisfies most customers without changing the meter.

These agencies will help furnish "that thoroughly efficient service" which will reduce the number of dissatisfied customers and convince them of the reliability of the meter.

*Presented at the Eastern States Gas Conference.



NEWS OF THE GAS INDUSTRY



N. Y. State Gas Men Hold Meeting

The Gas Section of the Empire Gas and Electric Association held a meeting in the auditorium of the Municipal Gas Company Building, Albany, New York, May 3 and 4.

In the forenoon of May 3, Col. Oscar H. Fogg, Secretary-Manager of the American Gas Association, made an address outlining various activities of the American Gas Association.

The meeting consisted largely of presentation of reports of various committees on subjects which had been assigned at a previous meeting. W. H. Earle of the Rochester Gas and Electric Corporation, read the report of the Committee on Standardization Tests of Water Heaters. Joseph Lucena, of the Syracuse Lighting Co., was unable to be present, and the report of the Committee on Utilization of Gas Industrial House-Heating and Appliances was presented by R. B. Howes, of the Consolidated Gas Company, New York.

Mr. Howes illustrated his talk with a series of charts which showed a curve in the load of each particular industry. He explained that these figures were taken from records in New York City, and in all cases might not apply in just the same way to other cities in the state, and that the manager of the company, knowing his prospective field, could very easily determine about the amount of gas each industry would require. According to his charts, the restaurants equipped with gas showed a very uniform load throughout the year, while others reached the peak in the winter, and came down to almost nothing in the summer months.

Mr. Howes said that there was no use of the gas companies trying to sidestep house-heating by gas, that they were bound to get a considerable load from this source, whether they wanted it or not, and at times when not expected. He stated that during the past winter, homes equipped with coal-burning heating appliances were not sufficient to heat the homes comfortably, because of the quality of the coal, and that these people immediately bought anything that would burn gas, and in many instances these appliances consumed a large amount of gas and produced very little heat, due to their construction. These appliances were all hooked up in various ways, and the gas company, of course, was required to furnish the fuel.

He suggested that gas companies go into this house-heating problem seriously, and do all in their power to install permanent heating apparatus from room heaters down to the gas-fired steam or hot water boiler, and have them hooked up in a permanent way. Then, if the weather bureau predicted a severe cold wave within 24 hours, the gas company, having a fairly accurate idea of the number of appliances and about what the consumer would pay, could immediately start preparations to take care of that additional load, and if the weather bureau predicted a warmer temperature within 24 hours, they could adjust their make to that condition.

Mr. Howes stated that in his opinion the cost of heating by gas over coal was not a very important feature. He said that when a man buys a "flivver," he immediately begins to lay plans to get a more expensive car at the earliest possible moment, and while the "flivver" would take in 18 or 20 miles on a gallon of gas, and some of the high powered, heavy cars would only take in 8 or 10 miles on a gallon of gas, that item of mileage and the extra cost of the larger car did not to any great degree enter into his considerations. He wanted comfort and convenience, and he was willing to pay the difference, and that is just what happened in the house heating by gas proposition.

On Friday morning, A. M. Beebe, of the Rochester Gas and Electric Corporation, read the report of the committee on "Elimination of Dust from Water Gas Blast Gases." This report with several charts, showing various designs of construction of apparatus, will be published in an early issue of the American Gas Journal.

All of these reports were freely discussed, and many questions asked, showing the very great interest of gas men in these various problems.

At the invitation of F. S. Dunn, of the Municipal Gas Co., Dr. Downing, of the Board of Regents, who has charge of the administration of all professional laws of the State of New York, addressed the meeting on the new law recently enacted in the State of New York, licensing engineers. Dr. Downing stated that the Board had divided engineering into five groups, as follows: civil, mechanical, chemical, mining and electrical. Every kind of engineering could be classified under one or the other of these five groups. Dr. Downing outlined what the Board considered the qualifications of a man to be classed as an engineer, and many questions were asked regarding men in various positions in the gas industry. It was finally decided that Mr. Carpenter, acting secretary of the Empire Gas and Electric Association, could appoint a committee of gas men, and they would decide at their next meeting just what men in the gas companies would be required to take out a state license as an engineer.

Wm. M. Carpenter, of the Empire Gas and Electric Association, read a paper entitled "The Future of the Gas Industry Lies in the Field Now Occupied by Coal."

W. H. Earle, of the Rochester Gas and Electric Corporation, was unanimously elected chairman of the gas section, and Joseph Lucena, of the Syracuse Lighting Co., vice chairman, for the entire year.

Public Utilities Securities Market Report

Prices of Representative Gas Bonds

(Quotations furnished by The National City Company)

Company.		Maturity	May 10, 1923. Bid	Asked
American Lt. & Trac. Co.	Five Year 6s	May 1, 1925	106	107
Brooklyn Union Gas Co.	First Consol. 5s	May 1, 1945	93½	94⅞
Columbia Gas & Elec. Co.	First 5s	May 1, 1927	96	97
Consol. Gas, Elec. Lt. & Pr. Co. of Baltimore	First Ref. 7½s	Dec. 1, 1945	110	111
Consol. Gas, Elec. Lt. & Pr. Co.	General 4½s	Jan. 1, 1935	90	91¾
New Amsterdam Gas Co.	First Consol. 5s	May 1, 1948	80	83
Denver Gas & Elec. Co.	Gen. (now 1st) 5s	Jan. 1, 1949	93½	95
Detroit City Gas Co.	Gold 6s	Jan. 1, 1947	99½	99⅞
Equitable Illum. Gas Lt. Co. of Philadelphia	First 5s	Jan. 1, 1928	99½	101
Hudson County Gas Co.	First 5s	Nov. 1, 1949	92	93¾
Laclede Gas Light Co.	Ref. & Ext. 5s	Nov. 1, 1934	93	93⅞
Michigan Light Co.	First & Ref. 5s	Mar. 1, 1946	88	90
Milwaukee Gas Light Co.	First 4s	May 1, 1927	93¾	94¼
Pacific Gas & Elec. Co.	Gen. & Ref. 5s	Jan. 1, 1942	90½	91
Pacific Gas & Elec. Co.	First & Ref. 7s	Dec. 1, 1940	106½	108
Cal. Gas & Elec. Corp.	Unif. & Ref. 5s	Nov. 1, 1937	95⅛	96¾
Peoples' Gas Lt. & Coke Co.	Refunding 5s	Sept. 1, 1947	87⅞	89
Chicago Gas Lt. & Coke Co.	First 5s	July 1, 1937	90½	94
Portland Gas & Coke Co.	First & Ref. 5s	Jan. 1, 1940	89	91
Seattle Lighting Co.	Refunding 5s	Oct. 1, 1949	81	83
Southern California Gas Co.	First 6s	Nov. 1, 1950	97½	99
Utica Gas & Electric Co.	Ref. & Ext. 5s	July 1, 1957	89	90¾
Washington Gas Light Co.	General 5s	Nov. 1, 1960	94¼	95¼
Western States Gas & Elec. Co. of California	First & Ref. 5s	June 1, 1941	90	92

Gas Co. Earnings Encouraging

Muskegon, Mich. — Net operation revenue from gas sales of the Muskegon Traction and Lighting Company for March, after the deduction of $2,128.84 interest charges, was $1,040.09. The net operation revenue on the street car line, after interest charges had been deducted, were $3,626.11.

The total revenue from the gas plant was $24,622.99, while the operation costs, without interest charges, were $21,454.06. In this connection it is interesting to note that sale of gas for industrial purposes was nearly as great as the domestic consumption, the industrial consumption being 6,852,000 cubic feet, as compared with 7,735,700 for domestic consumption. The company had 4,782 gas meters in operation at the close of the March business, a gain of 22 meters since January 1.

New Company Granted Franchise

DeLand, Fla.—The city council on April 27 granted a franchise to the proposed DeLand Gas Company, providing that when the city reaches a permanent population of 10,000, the gas company must furnish 1 per cent of its total output to the city for public use.

The decision was reached after a long session and much discussion, the council asking from the proposed company some assurance that the work will be done and the gas company asking from the city a franchise without "strings" of any kind. The council contended that to grant a franchise to a company that has no existence as yet is not becoming, and the friends of the company contending that it would be impossible to form a company without a franchise. Desiring to help the new matter along as much as possible, the council decided finally to waive its demands and grant the franchise.

It is expected that the laying of the gas mains will be started in three or four months at the outside. The building of the plant will take some months, so that the final date in which gas must be in operation under the franchise is eighteen months, and substantial work started in five months.

John E. Loiseau Moves Up

John E. Loiseau, for several years secretary-treasurer of the Montgomery Development and Water Power Company at Montgomery, Ala., a Doherty concern has been appointed to the secretaryship of the Denver Gas and Electric Light Company, filling the place made vacant when Clare N. Stannard was made vice-president and general manager.

Mr. Loiseau is one of the youngest executives in the Cities Service organization. He is a native of South Dakota and has served the Doherty interests in Ohio, Illinois and Alabama.

Since Mr. Stannard's promotion the secretary's work has been looked after by H. D. Hughes, treasurer of the company.

Declares Dividend

Boston, Mass.—The Massachusetts Gas Companies, through its treasurer, E. N. Wrightington, has announced that a dividend of 1¼ per cent has been declared upon the common shares of the corporation, payable May 1, to stockholders of record April 16.

New Britain Gas Light Quarterly Dividend

New Britain, Conn.—The regular quarterly dividend of 2 per cent has been declared by the directors of the New Britain Gas Light Co. The dividend was payable May 1.